The Structure of the Nucleus.

Cytology: With Special Reference to the Metazoan Nucleus. By Prof. W. E. Agar. Pp. xii+224. (London: Macmillan and Co., Ltd., 1920.) Price 12*s*. net.

CYTOLOGY as a science is of relatively recent growth, and its development was made possible only by improvements in the microscope. Yet the study of the details of cell structure and activity is now fundamental to almost every phase of biology. Nevertheless, biologists are too frequently content with a superficial or second-hand acquaintance with this fascinating field.

Previous to 1900 the process of mitosis had been investigated, the general constancy of the chromosomes from one cell generation to another was recognised, and their relations to fertilisation and reduction were understood in a general way, through the studies particularly of Strasburger and Hertwig: the foundations of the present cytology were laid. Synapsis had been recognised by Moore as a unique phase of the nucleus, and this led to a decade of active research by Farmer, Moore, Wilson, Strasburger, Grégoire, and a host of other plant and animal cytologists to elucidate the intricate course of events during the meiotic or reduction period.

But it is during the present century that improvements in method and increasing accuracy of observation have made possible the remarkable series of discoveries which have led to the present outlook on cytological problems. Particularly noteworthy has been the intimate linking up of the chromosomes with the problems of heredity, sex, mutation, and morphogenesis. This era of work began with the discovery of Montgomery in 1901 that the chromosomes in the nuclei of certain animals were in pairs, the members of which are respectively of maternal and paternal origin. Sutton in 1903 clearly established this relationship in an insect in which the chromosomes were of different sizes, and it is now a commonplace of observation in a large number of animals and plants. Several writers had already, shortly before the Mendelian phenomena became known, pointed out the theoretical possibilities for heredity which lie in the reduction division where the pairs of chromosomes are separated to enter different germ-cells. In the following two decades of research, the chain of evidence connecting the chromosomes with heredity and also with variation has drawn ever closer, until now the relationship must be regarded as definitely established.

One of the earlier stages in this proof was the discovery of the sex chromosomes in insects and afterwards in other animals. The initial suggestion of McClung, linking a particular chromosome with sex, was followed by notable discoveries by Wilson, Morgan, Doncaster, and a host of other investigators. Then a constant relationship between chromosome numbers and external characters was shown in the case of the Œnothera mutations; and still more recently the work of Morgan and Bridges on the non-disjunction of chromosomes and its relation to inheritance in Drosophila, combined with an enormous contemporary accumulation of collateral evidence of many kinds, has added the final link in the chain of evidence.

Recent work tends more and more not only to analyse the chromosomes themselves into their visible microscopic elements, but also to show the relationships which these bear to the hereditary Mendelian units. The chromatin morphology in related species is also being compared, and even chromosome phylogeny is no longer a visionary hypothesis.

All these and other recent developments in the field of cytology are admirably set forth in the work before us by Prof. Agar, who has thereby placed all biologists in his debt. The book will be chiefly useful to cytologists as a summary of the facts and the literature connected with a particular field—the nucleus in animals above the Protozoa. Within this purview are discussed many of the problems connected with nuclear structure. The author deals with mitosis and meiosis, syngamy and parthenogenesis, with a detailed discussion of these phenomena in various animal forms. He points out that the fundamental fact of meiosis is the segregation of the members of each pair of homologous chromosomes, and compares the parasynaptic and telosynaptic methods of meiotic pairing. We cannot agree with him that the telosynaptic method has been definitely disposed of, as it is still the best authenticated account in a number of plants and animals. Nor can we find any difficulty in the belief that both methods may exist in different organisms, a view first expressed ten years ago.

The account of meiosis in parthenogenetic eggs is welcome, but the discussion of the germ track in animals might have included a greater variety of forms.

The later chapters give a useful account of the sex chromosomes, theories of chromosome individuality and structure, and variations in chromosome number. An interesting chapter on heredity and morphogenesis considers the chromosome behaviour and sterility in hybrids, the cytological basis of mutation, and general questions

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relating to the *rôle* of the nucleus and the chromosomes in development. Another section gives a short account of the chondriosomes, while the final chapter is concerned with the nucleus in the Protista and the nuclear relationships in plants.

The book is well illustrated and excellently produced. While it can scarcely appeal to a wide circle of readers, it will be of great service to all those who wish to be informed concerning the results arising out of the work of the last twenty years on this subject. The cytologist will find it indispensable for reference, and biologists generally will turn to it for the more recent work relating to these problems.

R. R. G.

Our Bookshelf.

Aircraft in Peace and the Law. By Dr. J. M. Spaight. Pp. viii + 233. (London: Macmillan and Co., Ltd., 1919.) Price 8*s.* 6*d.* net.

THIS is a useful attempt to put before the public the main issues of international law relating to the air. In every new development of modern invention, law-making authorities are faced with the difficult task of applying old principles to developments not contemplated when those principles were formulated, and with such a revolutionary departure as the modern aircraft there is a grave risk of deception by a false analogy. The British method has been to apply as far as possible the principles of the Merchant Shipping Acts to aircraft. The idea is lacking in boldness and imagination, for there is little parallel between the two forms of navigation in relation either to the problems of the navigators themselves, or to the rights and liabilities of the public at large. Generally speaking, however, a wise caution has been exercised by those who framed the International Convention. From another point of view the fundamental issue in aerial navigation is the sovereignty of the air, and on this England reserved her opinion. Continental Powers, without exception, clearly realising the serious military problems before them if all comers were allowed unrestricted flight above their territories, maintained in full their dominion in the air above their lands and territorial waters. England, on the other hand, had a different problem to face. No aerial highway of any importance crosses her frontiers in any part of the world, but nearly all the aerial routes which link up her scattered dominions do almost invariably cross the territories of other nations; she ought, therefore, her aerial experts maintained, to hold out for free flight.

It would seem that this view exaggerated the difficulties put in the way of innocent traffic by the maintenance of sovereignty, and minimised the dangers of sudden invasion. We must not forget that the economic interests of Great Britain are just as dependent on military security as they are on theoretical freedom of transport, and therefore Dr. Spaight would seem to be quite correct in urging the maintenance of the doctrine of the sovereignty of the air. Popular panic is a disaster only less serious than actual assault. The book is well arranged and indexed, while the writer's comments on what is as yet almost an untested department of law of exceptional difficulty, are acute, unprejudiced, and well-informed.

W. B. F.

Wireless Telegraphy and Telephony: First Principles, Present Practice, and Testing. By H. M. Dowsett. Pp. xxxi + 331. (London: The Wireless Press, Ltd., 1920.) Price 9*s.*

THE object of this work is to provide a connecting link between the various elementary textbooks, intended for those taking up the study of wireless telegraphy, and advanced treatises dealing with particular aspects or branches of the subject. It does not aim at completeness, but usefully develops certain parts of the theory and practice involved. The author insists upon an adequate appreciation of the structure of the atom and the part played by its constituents for a clear understanding of the phenomena met with in wireless working, and puts forward conceptions which, if not presenting a perfectly true scale model of the atom, at any rate are helpful in fixing the ideas. Another theoretical chapter leads up to explanations of some of the methods used in spark and continuous-wave transmission; and perhaps the most important sections of the book deal with the thermo-ionic valve and the modern methods of its employment for both reception and transmission, upon which so much of the recent advances depends. Other developments dealt with are high-speed automatic transmission and direction finding. A considerable portion of the book is devoted to systems of measurement of electrical quantities adapted to wireless telegraph testing. The author concerns himself only with up-to-date methods, and historical matter does not form part of his scheme.

Chimica delle Sostanze Esplosive. By Prof. Michele Giua. Pp. xvi + 557. (Milano: Ulrico Hoepli, 1919.) Price 28 lire.

THIS treatise is written from the point of view of the laboratory chemist, and contains a very full account of the chemistry of explosive compounds. The author bases his work on that of Berthelot, and develops the theoretical treatment of explosive reactions on thermochemical lines. When dealing with the propagation of explosions through gases, the work of British investigators is practically unnoticed, and although a few references to papers do indeed appear in a table, they are omitted from the index. The treatment of this part of the subject thus appears to be rather superficial. The explosive compounds are described fully, and brief, but clear, accounts are given of the plant used in their manufacture. This section, with its numerous references to the litera-

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